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IS 4960 (1968): Universal and Elongated Type V-Blocks [PGD  
25: Engineering Metrology]



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IS : 4960 - 1968

# *Indian Standard*

## SPECIFICATION FOR UNIVERSAL AND ELONGATED TYPE V-BLOCKS

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# *Indian Standard*

## SPECIFICATION FOR UNIVERSAL AND ELONGATED TYPE V-BLOCKS

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( Continued on page 2 )

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# *Indian Standard*

## SPECIFICATION FOR UNIVERSAL AND ELONGATED TYPE V-BLOCKS

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 29 November 1968, after the draft finalized by the Engineering Metrology Sectional Committee had been approved by the Mechanical Engineering Division Council.

**0.2** V-blocks are widely used for workshop and inspection purposes for marking accurate centres, checking the geometrical shape of round workpieces, checking concentricity, parallelism, etc. Elongated type V-blocks are suitable for marking short shafts using one V-block only. Universal type V-blocks are particularly useful for smaller plants in variety reduction.

**0.3** Universal type V-blocks are usually supplied in matched pairs for use in marking, machining and inspection.

**0.4** While preparing this standard, assistance has been taken from GOST 5641-1961 'Prizmy Poberochnye i Razmetochnye (Vee blocks)' issued by the Gosudarstvennyj Komitet standartov, Mer i Izmeritel'nyh Priborov SSSR.

**0.5** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS: 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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### 1. SCOPE

**1.1** This standard covers the requirements for universal type of V-blocks of sizes 100, 160, 200 and 300 mm (workpiece size range from 8 to 300 mm) and elongated type V-blocks of sizes 40, 50, 63 and 100 mm (workpiece size range from 5 to 100 mm). It also applies to either single V-blocks or matched pairs of the same accuracy.

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\*Rules for rounding off numerical values (revised).

## 2. NOMENCLATURE AND DEFINITION

**2.1** For the purpose of this standard, the nomenclature indicated in Table 1 and the following definitions shall apply.

**2.1.1 Working Surfaces** — The term working surfaces applies to flanks of vees, base, end faces and side faces.

**2.1.2 Matched Pair** — Two V-blocks of same size and grade of accuracy.

**2.1.3 Tolerance on Flatness** — The permitted variation in the degree of flatness.

**NOTE** — A surface is said to be flat when all the elements that make up that surface are in exactly the same plane. The degree of flatness is the proportion to which the various elements that go to make up the surface lie in exactly the same plane.

**2.1.4 Squareness Tolerance** — The maximum permissible distance separating two imaginary parallel planes within which the surface under consideration can just be enclosed and which are perpendicular to the datum face of the part in question.

**2.1.5 Tolerance on Parallelism** — The maximum permissible distance separating two imaginary planes within which the surface under consideration can just be enclosed and which are parallel to the datum face of the part in question.

**2.1.6 Matching Tolerance** — Is applicable to matched V-blocks only. It is the difference in the heights above the base of the V-blocks to the top of the cylinders contacting near the bottom and near the top of the vee surfaces respectively of the two matched V-blocks ( see Fig. 1 ).

**2.1.7 Minimum and Maximum Size of Workpiece** — The minimum and maximum diameters of cylindrical workpiece that can be accommodated on the V-block.

**2.1.8 Axis of V-Block** — The line of intersection of the planes of the vee flanks.

## 3. MATERIAL

**3.1** The V-blocks shall be made from suitable high carbon steel or suitable cast iron in accordance with IS : 210-1962\* grade 20 or higher. V-blocks of steel shall be hardened to 700 to 760 HV ( see IS : 1501-1959† ).

**3.2** Cast iron V-blocks shall be suitably aged before finish-machining.

## 4. DESIGNATION

**4.1** A V-block shall be designated by its nominal size, preceded by letter 'U' or 'E' for universal or elongated type V-blocks respectively, the

\*Specification for grey iron castings ( revised ). ( Since revised ).

†Method for Vickers hardness test for steel. ( Since revised ).



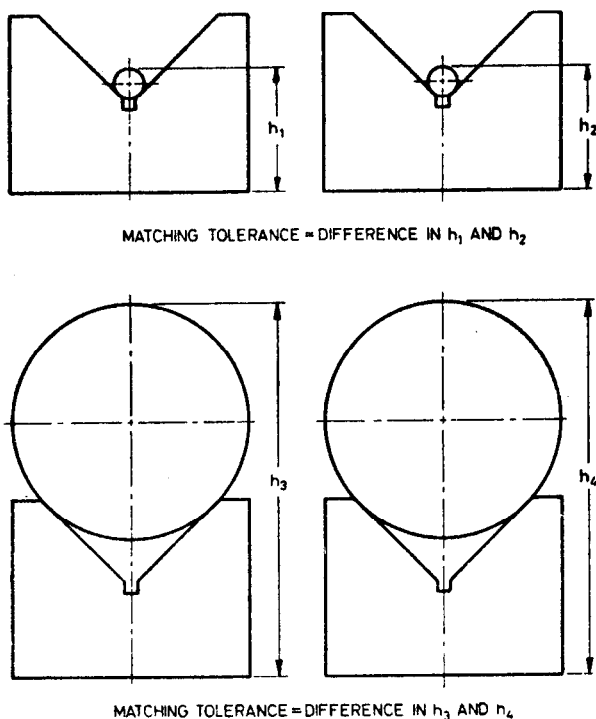


FIG. 1 MATCHING TOLERANCE OF MATCHED V-BLOCKS

grade of accuracy in case of universal V-blocks and followed by the number of this standard.

*Example:*

A universal type V-block having a nominal size 160 mm and grade of accuracy A, shall be designated as:

V-block U-160A IS : 4960

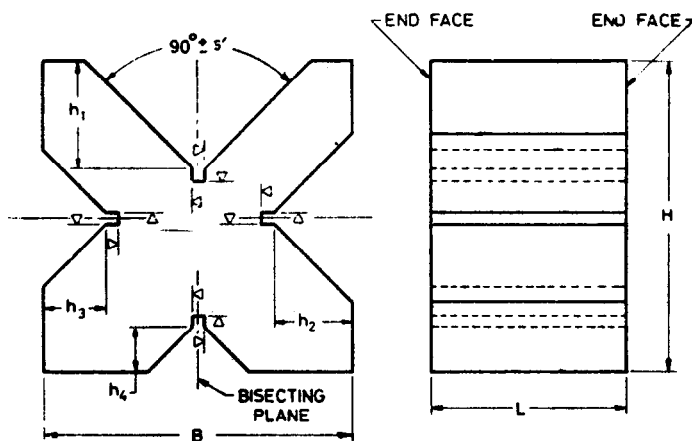
In case of matched pair, it shall be further preceded by letter 'M'.

For example: V-block MU-160A IS : 4960

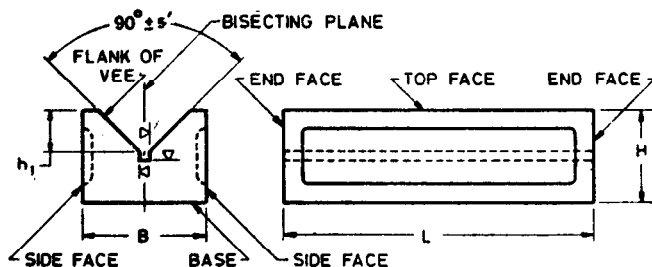
## 5. DIMENSIONS AND ACCURACIES

**5.1** The general dimensions of V-blocks of universal and elongated type shall be as given in Table 1.

TABLE 1 DIMENSIONS FOR UNIVERSAL AND ELONGATED TYPE V-BLOCKS

(Clauses 2.1 and 5.1)  
All dimensions in millimetres.

UNIVERSAL TYPE V-BLOCK



ELONGATED TYPE V-BLOCK

TYPE	NOMINAL SIZE B*	DIMENSION						DIAMETER OF WORKPIECE	
		L*	H*	h <sub>1</sub>	h <sub>2</sub>	h <sub>3</sub>	h <sub>4</sub>	Min	Max
Universal	100	63	100	35	25	20	15	8	100
	160	80	160	50	40	30	20	12	160
	200	100	200	70	50	40	30	16	200
	300	125	300	110	90	70	50	20	300
Elongated	40	100	30	15	—	—	—	5	40
	50	160	35	20	—	—	—	6	50
	63	200	50	30	—	—	—	7	63
	100	300	63	40	—	—	—	8	100

\*These dimensions are to be identical in the case of matched pairs while in others, they may be less than 5 percent from the values given above.

## 5.2 Accuracies of V-Blocks

**5.2.1** Universal V-blocks shall be manufactured in two grades of accuracy, Grade A and B. Elongated V-blocks shall be made to one grade of accuracy only.

**5.2.2** V-blocks shall comply with the tolerances for flatness of working surfaces, squareness of side and end faces, parallelism and squareness of ends with respect to vee flanks as specified in Tables 2 and 3.

**5.2.2.1** Deviation in flatness of the V-block is permissible only of the nature of concavity. In the case of vee flanks, however, the deviation in flatness in a direction parallel to the axis shall be a concavity while the deviation in flatness along the length of the vee flanks shall be a convexity.

**5.2.3** For matched pairs, the matching tolerance as specified in col 7 of Tables 2 and 3 shall apply in addition to other tolerances specified in the above tables.

## 6. GENERAL REQUIREMENTS

**6.1** Recessing of castings on V-blocks in order to reduce weight is permitted.

**6.2** Blow-holes, rust, non-metallic inclusions, scratches and other defects, on any surface of the V-blocks are not allowed. Any irregularities on the working surfaces shall be such as not to interfere with or influence the accuracy of the V-blocks in use.

**6.3** All sharp edges of the V-blocks shall be suitably rounded.

**6.4** Cast iron V-blocks shall be suitably aged. V-blocks shall be demagnetised and internal stresses relieved. Non-machined surfaces of the V-blocks shall be suitably painted.

**6.5** Each V-block or a matched pair shall be accompanied by a test certificate stating the quality and the corresponding requirements of the present standard.

**6.5.1** The test certificate shall contain:

- a) name of the manufacturer and address,
- b) type and nominal size of the V-block,
- c) grade of accuracy in the case of universal V-blocks,
- d) plant serial number of V-block (or pair number in case of matched pair), and
- e) date of acceptance by manufacturer's inspector.

**6.6 Bearing Area** — V-blocks which are finished by hand scrapping shall have a bearing area of not less than 20 percent. (A recommended method for determining this is given in Appendix A.)

**TABLE 2 ACCURACIES OF UNIVERSAL V-BLOCKS**

(Clauses 5.2.2 and 5.2.3)

Values in  $\mu\text{m}$  (0.001 mm).

NOMINAL SIZE	GRADE OF ACCU- RACY	FLATNESS OF WORKING SURFACE	MUTUAL SQUARE- NESS OF ALL WORKING SURFACES	PARAL- LELISM OF OPPOSITE FACES	*PARAL- LELISM OF AXIS OF V-BLOCK TO BASE	SYMMETRI- CITY OF THE BISECTING PLANE OF VEE TO THE SIDE FACES	SQUARE- NESS OF THE BISECTING PLANE OF VEE WITH BASE	MATCH- ING TOLER- ANCE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
mm								
100	{ A	10	15	15	15	15	15	8
	{ B	20	30	30	30	30	30	15
160	{ A	15	20	20	20	20	20	10
	{ B	25	35	35	35	35	35	18
200	{ A	20	30	30	30	25	25	15
	{ B	30	45	45	45	45	45	20
300	{ A	25	35	35	35	35	35	18
	{ B	40	60	60	60	60	60	25

\*This test is carried out by resting a true cylinder on the vee flanks and the parallelism of a generator of the cylinder with respect to the base of the V-block is determined.

**TABLE 3 ACCURACIES OF ELONGATED V-BLOCKS**

(Clauses 5.2.2 and 5.2.3)

Values in  $\mu\text{m}$  (0.001 mm).

NOMINAL SIZE	FLATNESS OF WORKING SURFACE	MUTUAL SQUARE- NESS OF ALL WORKING SURFACES	PARAL- LELISM OF OPPOSITE FACES	*PARAL- LELISM OF AXIS OF V-BLOCK TO BASE	SYMMETRI- CITY OF THE BISECTING PLANE OF VEE TO THE SIDE FACES	SQUARENESS OF THE BISECTING PLANE OF VEE WITH BASE	MATCH- ING TOLER- ANCE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
mm							
40	8	10	10	10	10	10	8
50	10	15	15	15	15	15	10
63	15	20	20	20	20	20	10
100	20	30	30	30	30	30	15

\*This test is carried out by resting a true cylinder on the vee flanks and the parallelism of a generator of the cylinder with respect to the base of the V-block is determined.

## 7. MARKING AND PACKING

**7.1** Each V-block shall be legibly and permanently marked with the particulars given below:

- a) Manufacturer's trade-mark,
- b) Nominal size and grade of accuracy of the V-block,
- c) Serial number or pair number according to 6.5, and
- d) Year of manufacture.

**7.1.1** The system for identification of V-blocks of matched pair shall be worked out by the customers themselves.

**7.1.2** The marking shall be applied in such a manner that it does not affect the accuracy.

**7.2** During storage and transit, V-block shall be protected against climatic conditions by being covered with a suitable corrosion preventive preparation.

**7.2.1** Before packing, the V-block shall be properly cleaned from corrosive chemicals. After being treated with anticorrosive solution, they shall be wrapped in a suitable packing paper. In case of matched pair, the two V-blocks so packed shall again be packed together.

**7.3** V-blocks may also be marked with the ISI Certification Mark.

**NOTE** — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution ( Certification Marks ) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

## APPENDIX A

( Clause 6.6 )

### DETERMINATION OF THE PROPORTION OF BEARING AREA

**A-1.** In order to determine the proportion of the bearing area of a V-block, its surface is first blued and rubbed with a small surface plate so that the small bearing areas are brought up clearly into view. A small glass plate on which an area  $40 \times 40$  mm has been ruled into 400 small squares  $2 \times 2$  mm in size, is then placed upon the surface. Each small square is

then observed in turn and a note made of the estimated fraction of its area ( in tenths ) which is occupied by a ' high spot ' on the surface underneath.

**A-2.** The addition of all these fractions when divided by four gives the percentage of the bearing area of the surface over the region tested. The test can be repeated at other position on the surface in order to obtain a fair average figure.

**A-3.** It may be mentioned that after testing a few surfaces by this method, the results obtained, coupled with the general appearance of the bearing areas, enable a fairly close estimate to be made of the proportion of bearing area of a surface merely from its general appearance.

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